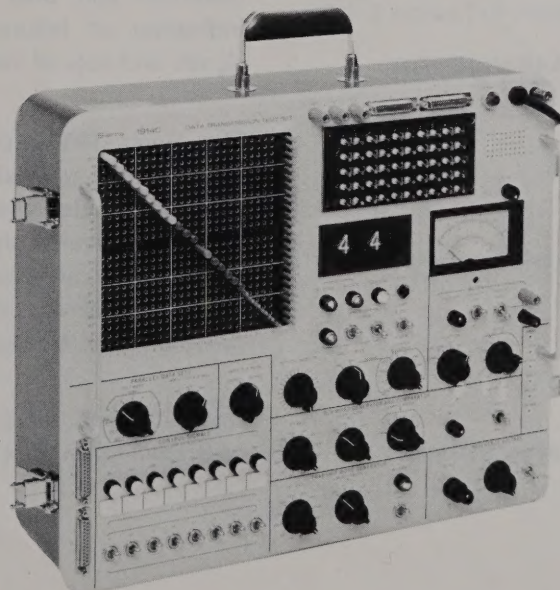# Sierra 1914C

DATA TRANSMISSION TEST SET

ISOLATES DATA TRANSMISSION FAULTS FAST!

The Sierra 1914C is the field instrument with laboratory features — the ideal test set for complete, fast, on-site testing of data transmission systems. Designed for use in installation and maintenance testing by telephone company craftsmen, modem manufacturers, modem users, time-sharing computer companies, and many other data users.

FEATURES

- TESTS ASYNCHRONOUS, SYNCHRONOUS VOICE-BAND MODEMS
- TESTS SERIAL, PARALLEL, ANALOG VOICE-BAND MODEMS.
- OPERATES WITH SIMPLEX, HALF-DUPLEX, FULL-DUPLEX DATA SYSTEMS
- TRANSMITS AND COMPARES FOUR TYPES OF TEST MESSAGES — DOT SIGNAL, 63-BIT, 511-BIT, 2047-BIT.
- AUTOMATIC OR MANUAL WORD SYNCHRONIZATION
- COUNTS AND DISPLAYS BIT OR BLOCK ERRORS
- VARIABLE-WIDTH WINDOW FOR SAMPLING RECEIVED DATA

- DETERMINES ERROR RATE MARGIN
- CHECKS SEQUENCE AND DELAY OF CONTROL SIGNALS
- DETERMINES TIME INTERVAL BETWEEN PULSES AND PULSE DURATION
- PERMITS IN-SERVICE TESTING OF MODEMS
- ALLOWS AUDIO MONITORING OF LINE
- AC, DC VOLTOHMMETER WITH 600 OHM TERMINATION
- CONFORMS TO EIA RS-232-C SPECIFICATIONS
- COMPATIBLE WITH BELL SYSTEM 902, 903 SERIES TEST SETS, WESTERN ELECTRIC CO. 914B, 914C TEST SETS
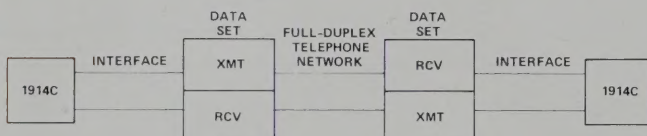
PRINCIPLES OF DATA TRANSMISSION TESTING

The signals by which business machines communicate are digital in nature. Since communications facilities used for the transmission of analog speech and signals are also used to transmit digital information, these digital signals must be adapted to the characteristics of voiceband communication lines. This is accomplished by a process of modulation at the transmitting location and subsequent demodulation at the receiving location. The modulation and demodulation is performed by a modem, or data set, that constitutes a vital link in an overall digital transmission system.
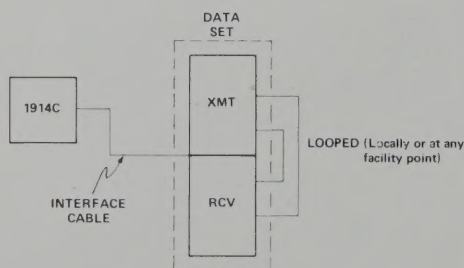
The performance of a data transmission system must be assessed in terms of parameters applicable to the digital terminal equipment. The most important consideration is the error rate of the transmission system. Bit error rate may be determined by transmitting a known test message and comparing the received message with a message identical to the one transmitted. Block errors may be detected when test message blocks of adjustable length contain one or more errors. Margin against error may be checked by sampling a portion of the bit interval and gradually enlarging the sample until the point at which an unsatisfactory error rate is reached.

In addition to modulation and demodulation, a data set performs numerous control functions that must also be tested to evaluate the performance of the overall system. This may be done by applying controlled signals to selected functions, by voltage measurements of interface leads, and by measurement of line signals transmitted and received.

The most common type of measurement of a total system for all test functions is an end-to-end test. When a fault has been localized, individual modems may be tested on a loop-back basis as depicted in the illustration below.

TYPICAL END-TO-END TEST ARRANGEMENT

TYPICAL LOOPED-BACK TEST ARRANGEMENT

GENERAL DESCRIPTION

The Sierra 1914C Data Transmission Test Set is a portable instrument used for static and dynamic tests of voice-band data systems. It is compatible with digital and analog modems now in operation and contains built-in flexibility which will allow its use on future systems. Both synchronous and asynchronous serial data modems can be tested. For tests of asynchronous modems, an internal clock produces test messages at any of 10 bit rates selected. Synchronous data modems that generate their own clock signals may be tested at any bit rate in the range from 10 to 20,000 bits-per-second.

Data transmission system performance is evaluated in terms of interval and pulse duration measurements and the bit or block error rate of the system. Interval, block error, or bit error counts are displayed on a two-decade electronic counter. In block error tests, the block length can be adjusted from a minimum of 63 to a maximum in excess of 32,000 bits. In tests of asynchronous modems, the received data signal is sampled at the mid-bit position by a pulse which is adjustable in width. This feature permits determining the error rate of the system and the margin against errors in one test.

The Sierra 1914C test set may be used simultaneously as a transmitting and receiving station of a data system. A programmable, cross-point matrix connects the internal test circuits to the interface of the data modem through interface selector switches. The matrix provides total flexibility in all interface connections, permitting tests of a modem or data system while the data terminal is connected to the transmitting or receiving modem.

Control signals to the data sets are manually generated by signal simulator switches and monitored by indicator lamps. Detectors and their associated lamps provide a visual indication of failure of transmitted and received data signals and loss of received clock signals.

The Sierra 1914C permits tests of analog modems and eight-channel parallel data modems as well as serial data modems. Parallel modems are tested by checking the error rate of all parallel channels, either simultaneously or any one channel individually. Analog modems are tested by measuring received output voltage and comparing it to the precision dc voltage applied.

Interface cords, test cords (one black, one red) and assorted programming pins are provided.

Reference Voltage (TP3) Output

Levels   0 to ±9.5 volts dc

Load (preset voltages)

Voltage Level (volts)	Minimum Resistance to Ground (ohms)
+7	No load
±2, ±1	51K
±0.4777	5.1K

GENERAL

Meter Input

    DC volts   0 to ±30 volts dc

    AC volts   0 to 1.0 volts ac

                         0 to −40 dBm (600 ohms)

Power Requirements

    Amplitude   115 volts ac

    Frequency   48 to 65 Hz

    Power   60 watts, approximately

Environmental Considerations

    Operating Temperature Range (ambient)   +4°C to +50°C

    Humidity   95 percent maximum

Dimensions

    Height   15 inches (381 mm)

    Width   18-1/2 inches (470 mm)

    Depth   7-1/2 inches (191 mm)

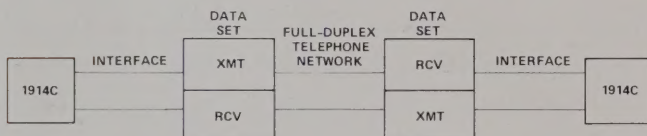**Weight**   Approximately 27 pounds (12.3 kg)

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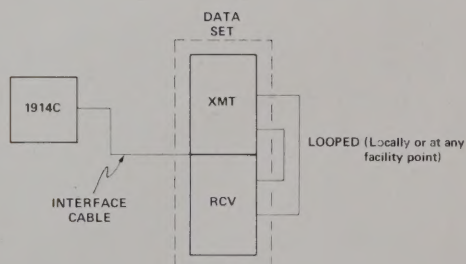
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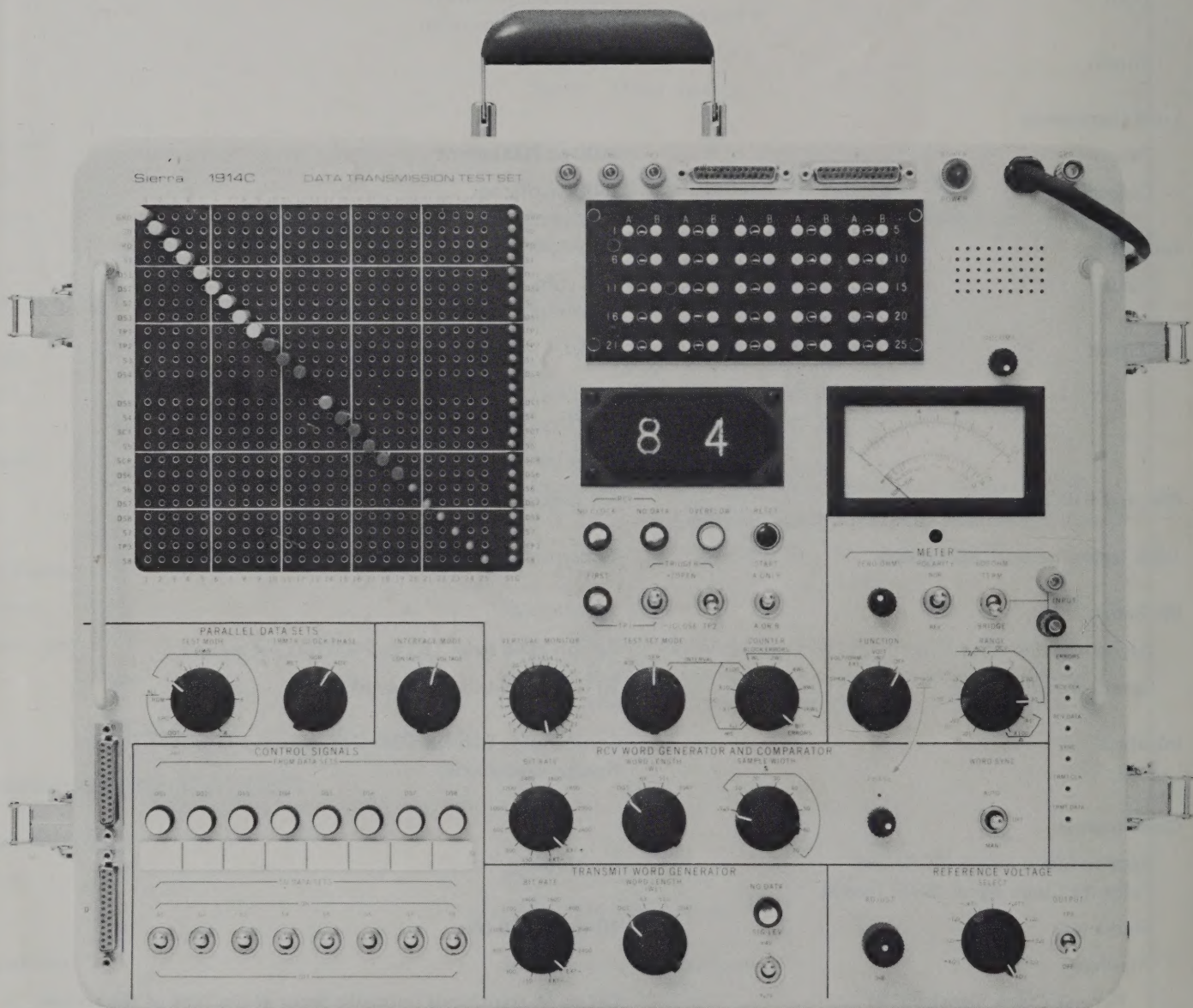
Serial Data Circuits

Receive Data (RD and Send Data (SD) format	Nonreturn to zero (NRZ)
Impedance:	
Input	3000 ohms minimum
	7000 ohms maximum
Output	200 ohms
Load Impedance:	
Resistive	3000 to 7000 ohms
Capacitive	2500 picofarads
Amplitude:	
Input	±3 volts minimum
	±25 volts maximum
Output	Mark: −4.0 volts ±0.3 volt high level
	−0.7 volt ±0.15 volt low level
	Space: +4.0 volts ±0.3 volt high level
	+0.7 volt ±0.15 volt low level
Rise and Fall Time (SD)	<1 microsecond
Jitter (asynchronous RD signals)	40 percent maximum peak-to-peak
Bit Rates:	
Asynchronous	Ten bit rates from 150 to 2400 bits per second
Synchronous	10 to 20,000 bits per second
Interface	Conforms to EIA RS-232-C Standards and CCITT V.24 Recommendations
Clock Signals:	
Receive Clock signal (SCR) and Transmit Clock signal (SCT) format	Squarewave
Frequency	10 to 20,000 Hz
Phasing:	
Receive Clock Signal (SCR)	Off to on transitions normally occur at the time of the receive data transitions
Transmit Clock Signal (SCT)	Off to on transitions normally occur at the time of the send data transitions

Eight-Channel Parallel Data Circuits

Input and output format	Nonreturn to zero (NRZ)
Bit Rate	75 bits-per-second
Signal	Contact closure to ground —
	Mark: Closed contact
	Space: Open contact
Transitions:	
Input	Occur prior to the transitions of the timing signal
Output	Must occur within ±1.5 millisecond of the change of state of the timing signal
Chatter (SD)	Less than 0.5 millisecond
Interface:	
Input	100 milliamperes maximum load (500 milliamperes surge) at up to 50 volts during a contact closure
Output	Closed contact: <20 ohms
	Open contact: >300K ohms resistance and 300 picofarads ±100 picofarads capacitance to ground
Timing Signals:	
Format	Squarewave
Transitions	Input: A 5-millisecond closure at beginning of each character
	Output: Must occur at beginning of each character and contact must remain constant for the duration of the character

Control Signal Inputs (DS1–DS8)

Voltage Level Mode:	
Level	Off: 0 to −4 volts dc
	On: +3 to +4.0 volts dc
Impedance	3000 ohms series resistance
Contact Closure Mode	Off: Open circuit
	On: Closed circuit to ground

Control Signal Outputs (S1–S8)

Voltage Level Mode	Off: −3.5 to −5.0 volts dc
	On: +3.5 to +5.0 volts dc
Contact Closure Mode	Off: Open circuit
	On: Closed circuit to ground